

TECHNICAL MEMO – SOUND SYSTEM COMMISSIONING AND CALIBRATION

Project	60 Oldham Street, Manchester
To	Phil Harrison, Director, MECB Manchester Ltd
From	Robert Miller, Director, F1 Acoustics Company Limited
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1 INTRODUCTION

F1 Acoustics Company Limited has been appointed by MECB Manchester Ltd to provide sound system commissioning testing and calibration at 60 Oldham Street, Manchester to support the planning application for the change of use from a restaurant to a ground and basement floor bar.

This technical document aims to demonstrate that the sound system as installed is set to and does not exceed reasonable criteria for music noise levels in the residential premises first floor and above of the same building.

2 MUSIC NOISE LEVEL CRITERIA

The nearest noise sensitive premises is a residential unit on the first floor above the proposed bar at 60 Oldham Street, Manchester. Based on Manchester City Council (MCC) guidance ("Planning and Noise – Technical Guidance", MCC. October 2022), music noise levels in the 63 Hz and 125 Hz octave centre frequency bands ($L_{Zeq,5min}$) are suggested to be controlled such as not to exceed (in bedrooms) 47 dB and 41 dB, respectively. It is also appropriate to set a broadband ($L_{Aeq,5min}$) limit based on achieving at least 5 dB below the corresponding BS 8233:2014 internal noise target. These limits would apply any time the ground floor or basement is operational, day or night, therefore the music noise level broadband criterion is $L_{Aeq,5min}$ 25 dB.

MCC recommends that music noise (L_{eq}) breaking out through the building frontage of an entertainment venue should not exceed 5 dB below the background noise level (L_{90}) at all octave band frequencies at the nearest noise sensitive windows. For this development, the nearest residential receptor is the window of the first floor flat overlooking Oldham Street.

It is noted that the first-floor residential unit is owned by the tenant to facilitate a "live-in" manager for the commercial unit below so the risk of complaint is low, however, it should be ensured that noise transfer levels are controlled in line with the requirements of MCC should the first-floor residential unit later be occupied by another party.

3 SOUND INSULATION TEST METHODOLOGY

The test was undertaken between 23:30 and 02:30 on Monday 18th September 2023. The following methodology was followed to set the music noise levels in the ground floor and basement bar areas at 60 Oldham Street, Manchester:

- Existing limiter and equalisation settings were removed from the system (other than those for amplifier protection and room corrections, respectively). Amplifiers were set to maximum output so that they cannot be turned up after the calibration has been completed.

- Measured the ambient sound level in the living room and bedroom of the first floor flat with no music noise playing from the ground floor bar. Significant sound sources including vehicles passing on local roads were paused out from the measurement.
- Music in the ground floor bar was switched on and reduced to a sound level that was compliant with the criteria adjusting the overall broadband sound level and low frequency output of the sound system.
- The sound level in the living room and bedroom of the first floor flat was then measured with the music noise playing at the set level. Significant sound sources including vehicles passing on local roads were paused out from the measurement.
- Without changing the music noise level in the ground floor bar the limiter was then set to just trigger on the loudest moments of the track being played.
- Spatial average sound level measurements of the music noise were taken of the ground floor bar area.
- The process was then also completed for the basement bar.

4 SOUND SYSTEM SPECIFICATION

The sound system specification for the ground floor and basement bar areas is provided in Table 4.1 and 4.2.

Table 4.1: Sound System Specification Ground Floor Bar

Component	Details
Amplifier	1.5x Dynachord SL 1200 mid/tops 1x SL 2400 for subs
Processing	1x Soundweb London BLU-100 (same unit as basement)
Speaker	6x RCF - Compact M08
Sub-woofer	2x RCF - RCF8015LP

Table 4.2: Sound System Specification Basement Floor Bar

Component	Details
Amplifier	2.5x Dynachord SL 1200 mid/tops 1x SL 2400 for subs
Processing	1x Soundweb London BLU-100 (same unit as ground floor)
Speaker	8x RCF - Compact M06 2x RCF - Compact M04
Sub-woofer	2x RCF - RCF8015LP

A plan of the speaker locations is provided in Annex A.

5 NOISE MEASUREMENT EQUIPMENT

Sound level measurements were made using a Class 1 Rion NL-52 sound level meter (F1AC-066) and a Class 1 Rion NC-75 sound level calibrator (F1AC-067). The sound level meter was checked for calibration before and after the measurements and no significant deviation in the reference sound level was recorded.

6 INTERNAL MUSIC NOISE LEVEL MEASUREMENT RESULTS AND DISCUSSION

The aim of the music noise level quantitatively set inside the ground floor and basement bars at 60 Oldham Street, Manchester, was to ensure that the music noise level did not exceed the criteria in the nearest residential property at first floor in the same building.

The installed sound system processing unit has controllable output levels and a limiter that has been set based on the methodology explained above to the required criteria. Measurements were taken of the greatest possible output sound level with a representative music track (Eurythmics – Sweet Dreams (Are Made of This)).

The results of the final measurements in the ground floor bar and living room and bedroom of the first floor flat are provided in Table 6.1 below.

Table 6.1: Ground Floor Bar Music Noise Level Assessment

Sound Level	Broad-band, L _{Aeq,1min} , dB	Octave Band, L _{Zeq,1min} , dB							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Ground floor bar (music)	74	75	80	71	70	70	66	62	56
First floor living room (ambient)	25	37	31	27	22	18	16	16	14
First floor living room (music) ¹	25	39	35	27	21	18	15	14	14
Music noise level criteria	25	47	41	-	-	-	-	-	-
Achieves criteria?	Yes	Yes	Yes	-	-	-	-	-	-
First floor bedroom (ambient)	22	28	30	25	17	15	13	13	14
First floor bedroom (music) ¹	24	39	36	26	18	15	12	13	14
Music noise level criteria	25	47	41	-	-	-	-	-	-
Achieves criteria?	Yes	Yes	Yes	-	-	-	-	-	-

1 – Not corrected for ambient therefore a worst-case assessment.

The results of the final measurements in the basement bar and living room and bedroom of the first floor flat are provided in Table 6.2 below.

Table 6.2: Basement Bar Music Noise Level Assessment

Sound Level	Broad-band, L _{Aeq,1min} , dB	Octave Band, L _{Zeq,1min} , dB							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Basement bar (music)	85	82	85	85	82	81	75	72	65
First floor living room (ambient)	24	35	29	25	23	19	15	14	14
First floor living room (music) ¹	24	35	33	28	20	17	14	14	14
Music noise level criteria	25	47	41	-	-	-	-	-	-
Achieves criteria?	Yes	Yes	Yes	-	-	-	-	-	-
First floor bedroom (ambient)	22	27	30	26	16	14	12	12	14
First floor bedroom (music) ¹	23	30	31	27	17	15	13	13	14
Music noise level criteria	25	47	41	-	-	-	-	-	-
Achieves criteria?	Yes	Yes	Yes	-	-	-	-	-	-

1 – Not corrected for ambient therefore a worst-case assessment.

The results of the final measurements of the cumulative music noise (from the ground floor and basement bars at the same time) in the living room and bedroom of the first floor flat are provided in Table 6.3 below.

Table 6.3: Cumulative Ground Floor and Basement Bars Music Noise Level Assessment

Sound Level	Broad-band, L _{Aeq,1min} , dB	Octave Band, L _{Zeq,1min} , dB							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Ground floor and basement bars as per Tables 6.1 and 6.2 (music)	-	-	-	-	-	-	-	-	-
First floor living room (ambient)	25	35	30	27	23	19	16	14	14
First floor living room (music) ¹	25	38	38	28	20	17	14	13	14
Music noise level criteria	25	47	41	-	-	-	-	-	-
Achieves criteria?	Yes	Yes	Yes	-	-	-	-	-	-
First floor bedroom (ambient)	23	28	30	25	18	16	15	14	14
First floor bedroom (music) ¹	24	41	35	27	17	15	13	13	14
Music noise level criteria	25	47	41	-	-	-	-	-	-
Achieves criteria?	Yes	Yes	Yes	-	-	-	-	-	-

1 – Not corrected for ambient therefore a worst-case assessment.

The sound system processing final settings for compliance are provided in Table 6.4 below.

Table 6.4: Sound System Processing Key Settings

Setting	Ground Floor Bar	Basement Bar
Source Signal Input	+6 dB	+6 dB
High Pass Filter	63 Hz -24 dB per octave	63 Hz -12 dB per octave
Graphic Equaliser	50 Hz -3 dB 63 Hz -5 dB 80 Hz -5 dB 100Hz -5 dB 125 Hz -5 dB 160 Hz -3 dB	None
Output Channels (to Amps)	G01 -15.5 dB G02 -18.5 dB G03 -24.5 dB G04 -24.5 dB G05 -24.5 dB	B06 -13 dB B07 -13 dB B08 -13 dB B09 -13 dB B10 -13 dB B11 -13 dB B12 -13 dB
Master Output	+5 dB	+5 dB

7 EXTERNAL MUSIC NOISE LEVEL ASSESSMENT

The report and assessment written by Hann Tucker Associates (HT: 30509/PTM3) dated 9th March 2023 includes a comprehensive external music noise breakout assessment from the ground floor bar in Section 5. The assessment table from Sub-section 5.3 is reproduced below as Table 7.1. Table 7.1 has been updated from the original assessment to include the proposed maximum music noise level for the first floor bar from Table 6.1 above. The nearest external receptor is the first floor flat living room window. Further information on the background noise survey is available in the Hann Tucker Associates report.

Table 7.1: External Music Noise Level Breakout Assessment

Sound Level	Octave Band Unweighted, dB							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	
Internal noise level (dB L_{eq}) SPL_{in}	75	80	71	70	70	66	62	
Estimated composite SRI of façade	27	26	28	33	33	31	30	
Distance & radiating area propagation correction (dB) $10\log_{10}(S/r^2)$	1	1	1	1	1	1	1	
Screening Loss (dB)	-5	-5	-5	-5	-5	-5	-5	
Internal diffuse field to external free-field hemispherical radiation correction (dB)	-14	-14	-14	-14	-14	-14	-14	
External noise level at nearest receptor (dB L_{eq}) SPL_{out}	30	36	25	19	19	17	14	
Criteria at nearest receptor (dB L_{eq})	38	36	35	32	30	34	22	
Criteria achieved?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

The re-assessment demonstrates that the external music noise level at the nearest noise sensitive receptor will achieve the required criteria based on the proposed maximum internal music noise level in the ground floor bar.

The basement bar has not been considered as there is no direct sound path from the basement bar to Oldham Street. The basement bar has a lobby door system to ensure no significant music noise will breakout.

During the internal music noise level testing on 18th September 2023 ambient measurements were taken at the first floor flat living room open window and with the ground floor bar music operating, however, the existing ambient noise levels were above the criteria. This is not surprising as the external music noise level criteria are based on being below the previously measured background (L_{90}) sound level and it would not be possible in any reasonable situation to measure an ambient (L_{eq}) noise level below the background. Aural observations made during these tests confirmed that the music noise from the ground floor bar was not audible at the open window to the first floor flat living room overlooking Oldham Street.

8 SUMMARY

F1 Acoustics Company Limited has been appointed by MECB Manchester Ltd to provide sound system commissioning testing and calibration at 60 Oldham Street, Manchester to support the planning application for the change of use from a restaurant to a ground and basement floor bar.

Analysis of the measured sound level data shows that the currently set internal music noise levels in the ground floor and basement bars will achieve the internal and external music noise level criteria. For reference key sound system settings applied within the sound system processing unit are also presented.

If further noise mitigation or sound insulation work is carried out, re-testing and re-assessment may demonstrate that louder music noise levels may be permitted if the music noise level criteria discussed in this report are still achieved.

ANNEX A

Speaker Layout Plan

